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ABSTRACT

An investigation was undertaken of end-of-course reactions of students who experienced varying numbers of test-taking failures during an introductory psychology course presented under two different formats: a mastery structure (multiple study/test options and absolute grading standards) and a conventional structure (one try on each midterm with relative standards). The subjects were 74 students who experienced subjective failure on both of two midterms under conventional circumstances and 145 students who failed two, three, or four times under conditions of repeated test opportunities. To assess the impact of accumulating failures, students responded to a final course evaluation form consisting of 28 questions. Subsequent factor analysis reduced these responses to six factors. Because students took more tests under the mastery condition, more subjective failure incidents were reported. Yet despite the greater absolute number of failure experiences, there was no greater deterioration of feelings of personal control, achievement orientation, or sense of enjoyment. Overall, the mastery students expressed significantly greater confidence and aspirations and assessed the system as more fair. Path analysis identified the cause of the continuing positive motivation as increased objective performance, which itself depends on the multiple study/test option. It is concluded that as long as students show increasing objective performance, short-lived failures along the way play little part in determining overall course evaluation. Behavioral instruction appears to be a beneficial system for all students, especially for slow learners. (Author/SW)

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Behavioral instruction (mastery learning) has been shown to increase student performance when contrasted to conventional classroom structures (Kulick, Kulick & Cohen, 1979). Recently it has been demonstrated that this performance superiority occurs largely because of the multiple test/study option. But are there any psychological costs involved in repeated test taking? Recent research (Covington & Omelich, 1980) indicates that while a recursive study/test cycle ultimately guarantees successful performance for most students, many students (up to 60% on any given test occasion) may fail to achieve their own personal grade-goal aspirations. The troublesome part of such individual failures is that they lead to increasing self-doubts about one's ability to achieve which, in turn, cause increased shame, lower expectancies of ultimate success and, eventually, reduced performance (Covington & Omelich, 1980). It is possible, however, that each separate failure experience may be perceived by students as only a temporary setback, and that the overall performance gains that accumulate may be offsetting so that negative affect and attributions do not accumulate over an entire course. This possibility is the subject of the present study.

We assessed end-of-course reactions of students who experienced varying numbers of test-taking failures during an introductory psychology course presented under two different formats: A mastery structure (multiple study/test options and absolute grading standards) and a conventional structure (one try on each midterm with relative standards). Subjects were students who experienced subjective failure on both of two midterms under conventional circumstances (N= 74) and those students, in contrast, who failed two, three or four times under conditions of repeated test opportunities (N= 145). To assess the impact of accumulating failures, students responded to a final course evaluation form consisting of 28 questions. Subsequent

factor analysis reduced these responses to six factors whose scores were employed in the study.

Because students took more tests under the mastery condition, not surprisingly, more subjective failure incidents were reported. Yet despite the greater absolute number of failure experiences, there was no greater deterioration of feelings of personal control, achievement orientation, or sense of enjoyment. Indeed, overall the mastery students expressed significantly greater confidence and aspirations and assessed the system as more fair. Path analysis identified the cause of the continuing positive motivation. Increased objective performance, which itself depends on the multiple study/test option, was the primary cause of sustained motivational involvement regardless of the incidence of failure. Thus, our concern that repeated failure in a mastery learning paradigm might demoralize some students through increasing self-estimates of inability seems unfounded. In actuality, students under the conventional system showed a greater deterioration in their self-estimates of ability.

We conclude that as long as students show increasing objective performance, short-lived failures along the way play little part in determining overall course evaluation. Thus behavioral instruction appears to be a beneficial system for all students, especially for slow learners who may require several tries before the material is mastered. These high-risk students share much in common with the "new student" population described by Cross (1972) as failure-prone, ability-doubting adults.

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In recent years well-known laboratory learning principles have been applied in the classroom in an attempt to individualize the teaching/learning act. By far the most vigorous of these current efforts is the behavioral instruction approach which features absolute performance standards, repeated testing and the breakdown of subject-matter material into small study units. Behavioral instruction (mastery learning) has been shown to increase student performance when contrasted to conventional classroom structures (Kulick, Kulick & Cohen, 1979). Recently it has been demonstrated that this performance superiority occurs largely because of the multiple test/study option. But are there any psychological costs involved in repeated test taking? Recent research (Covington & Omelich, in press) indicates that while a recursive study/test cycle ultimately guarantees successful performance for most students, many students (up to 60% on any given test occasion) may fail to achieve their own personal grade-goal

aspirations. The troublesome part of such individual failures is that they lead to increasing self-doubts about one's ability to achieve which, in turn, cause increased shame, lower expectancies of ultimate success and, eventually, reduce performance.

Ironically, such negative consequences of failure are likely to be magnified in the behavioral instruction paradigm. Not only is the likelihood of repeated failure greater due to more test opportunities, but also the attributional meaning of these failures is likely to differ from those in conventional courses where more self-serving, failure excuses are available to help the student avoid the implication of low ability (Covington & Omelich, 1979b; in press). Due to the recursive study-test cycle and fixed standards of excellence, it should become increasingly less palusible for the mastery student to blame his/her failures on insufficient study or on such external factors as teacher caprice, bad luck or task difficulty.

Thus we can question whether or not the greater incidence of failure experienced by some students in the pursuit of uniform excellence undercuts the performance advantages of behavioral instruction. We suspect not, but rather that each separate failure experience may be perceived by students as only a temporary setback, and that the overall performance gains that accumulate with repeated testing may offset the negative affect and attributions associated with each individual test failure. Specifically, it is hypothesized that multiple

trials, largely because of enhanced performance, will lead to more positive self- and system-evaluations even in failure. Further, it is expected that these same success increments will occasion less deterioration in ability estimates and hopes of ultimate success, thus forestalling the signs of despair so frequently associated with the learned helplessness syndrome (Abramson, Seligman & Teasdale, 1978; Covington & Omelich, in press).

Subjects and Procedures

In order to test these predictions, we assessed the reactions of students who experienced varying numbers of test-taking failures during an introductory psychology course presented under two different formats: A mastery structure (multiple study/test options and absolute grading standards) and a conventional structure (one try of each midterm with relative standards). Actually, the 425 undergraduate students in the course were randomly assigned either to a norm-referenced or criterion-referenced grading condition and within each grading condition, to either a one-test or two-test condition. Thus, four conditions were established: one-test, criterion-referenced (C1); two-test, norm-referenced (N2); two-test, criterion-referenced (C2); and two-test, norm-referenced (N2). Subjects in this study were students who experienced subjective failure on both of two midterms under conventional, one-trial circumstances (N=74) and those students, in contrast, who failed two, three or four times

under conditions of repeated test opportunities (N=145). The remaining students in the course considered their performances an overall success and are not included in the analysis. To assess the impact of repeated failure, grading standards and number of trials on student motivation and evaluative reactions, subjects were asked to respond to a series of questions after having completed these two instructional units. The 18 system evaluation and 10 motivational questions were factor analyzed to form the scores used in this analysis.

Results and Discussion

Failure-group Differences

Principle-components analysis of the 28 self-report items resulted in a six factor solution accounting for 59.8% of the data set variation: (1) Achievement Orientation (22.7%), (2) System Fairness (15.1%), (3) Personal Confidence (8.3%), (4) Grade Aspirations (5.5%), (5) System Enjoyability (4.4%), and (6) Internality (3.8%). Factors 1, 3 and 4 were heavily loaded by personal-referent items and tap motivationally-linked reactions; whereas factors 2, 5, and 6 were defined by student attitudes toward the course structure.

Results of some of our earlier work (Omeliich & Covington, 1981) indicated that a mastery learning paradigm (C2) in general fosters higher personal grade aspirations (Factor 4) and confidence (Factor 3) as well as a greater sense of system fairness (Factor 2) and responsiveness to effort (Factor 6). However, we can now inquire whether the greater

incidence of failure experienced by some students in a repeated testing system undercuts these generally positive motivational advantages of behavioral instruction. Table 1 displays mean values on the six derived factors for students who experienced subjective failure on both of two midterms under the conventional, one-trial system (FF1, N=74) and those who failed two (FF2, N=76), three (FFF2, N=57) or four (FFFF2, N=12) times under the multiple-trial system. Mean differences ($\bar{d}$) between each of the two-trial groups and the one-trial group are indicated in the appropriate column.

First, we should note that indeed there is a greater overall frequency of subjective failure experiences under mastery learning--only 51% of the conventional system students failed twice as compared to 74% of the mastery students to experience at least two subjective failures. But, does this lead to a deterioration of motivational involvement? Inspection of columns 1 and 2 of Table 1 indicates that two-time failure students in the mastery condition experienced no greater deterioration in their sense of internality ($\bar{d} = -.05$), achievement orientation ($\bar{d} = -.24$) or sense of course enjoyment ($\bar{d} = -.06$), $p > .05$, when compared to two-failure students under the conventional system. Indeed, they were superior in the confidence they expressed ($\bar{d} = -1.09$), in the grade aspirations they held ($\bar{d} = -.79$) and in their assessment of system fairness ($\bar{d} = -.81$), $p < .05$. Thus, number of failures per se was not detrimental to motivationally-linked responses in mastery learning. However, the ratio of failures to number of test opportunities undoubtedly played a role in maintaining motivational level. When number

of failures was equated at two for both mastery and conventional students, overall success experiences were not, an inequity favoring the mastery students who had two successes to balance their disappointments. On the basis of this overall more positive performance alone we might expect these FF2 students to maintain more positive motivational involvement. Moreover, the pattern of success and failure may still prove influential, a possibility not precluded by the present research. As our earlier work has shown (Covington & Omelich, in press), one of the most likely influential patterns for sustaining motivation is that of belated success, where satisfactory achievement is attained only after initial failure, a circumstance available only under behavioral instruction.

The more critical comparisons are those instances where absolute frequency of failure is greater under mastery learning, with individuals feeling that they failed more often than they succeeded (FFF2, column 3) and some that they never succeeded at all (FFFF2, column 4). Despite their greater overall frequency of subjective failure, the three- and four-failure mastery students were no less positive in their assessment on four of the six evaluation clusters, $p > .05$. They maintained equal achievement orientation ($\bar{d} = -.26, -.58$) and aspirations ($\bar{d} = -.20, -.06$) and judge the systems as equally enjoyable ($\bar{d} = .16, -.42$) and responsive to effort (internality, $\bar{d} = -.22, -.11$). Moreover, three-time failure students saw their system as more fair ($\bar{d} = -.66, p < .05$) than did conventional failure students. Even the four-failure mastery

group saw no cause to downgrade their system on this issue of equity ($\bar{d} = -.35$). Perhaps even more incredible than this overall lack of motivational and evaluative differences was the superior confidence level expressed by both three- ($\bar{d} = -.49$) and four-failure students ($\bar{d} = -.53$) over two-failure conventional students, $p < .05$.

Thus, despite repeated--and for some, total--failure, which should lead to heightened despair, the multiple-failure mastery students maintained a positive evaluative set equal to their conventional counterparts and, indeed, surpassing them in confidence level. While this is understandable where success experiences balance failure experiences (FF2), this explanation cannot apply to three- and four-failure mastery students. Something else is operating to maintain motivational level and to offset the negative implications of repeated failure seen when we focus on the individual test experience. Doubtless this factor is enhanced performance. Indeed, despite a subjective sense of repeated failure, each of the mastery failure groups still performed objectively better ($\bar{d} = 12.73, 7.90, 2.60$, respectively, $p < .05$) than the two failure conventional students.

Causal Dynamics

This comparison of failure groups can identify differences in reactions, yet it does not directly address the question of causal dynamics underlying these differences. For example, while it has been demonstrated that multiple testing increases

student confidence even in failure, it is not immediately clear that the implied causal linkage is a direct one or whether the effects of extra study time on confidence is mediated through a second intervening factor such as actual performance gains. Thus, recursive testing may cause increases in performance which in turn raise student expectations.

Accordingly, we expect that increased performance will prove an important mediator linking the structural characteristics of mastery learning (e.g., repeated testing, absolute standards) with various motivational and affective outcomes. Path analysis, a variant of multiple regression techniques, was used to assess the underlying causal dynamics of mastery learning superiority even in failure. A schematic of the complete model being assessed is given in Figure 1. As can be seen, four sources of influence are possible. First, a given reaction can follow directly from multiple testing ($\text{Trials} \rightarrow X$). Second, it could also be a direct result of absolute standards ($\text{Standards} \rightarrow X$). Third, actual performance can exert a direct, independent influence on the reaction, regardless of standards or trials ($\text{Performance} \rightarrow X$). And, finally, standards or trials can also exert an indirect influence on the reactions through increased performance ($S \rightarrow P \rightarrow X$ or $T \rightarrow P \rightarrow X$): Absolute standards or multiple trials, or a combination of these, increase performance, which in turn promotes the particular student reaction.

Path coefficients (P) (standardized regression values) were derived from regressing each of the evaluation factors

separately on number of trials, presence or absence of absolute standards, and actual performance level. Two basis patterns emerged in the four path analyses performed (see Table 2).

Grade aspirations and personal confidence: Increased aspirations ($\underline{P} = .802, p < .05$) and confidence ($\underline{P} = .357, p < .05$) followed directly from increased performance, a linkage so strong in the instance of aspirations that performance accounted for 96% of the variation in this student reaction regardless of standards/ trials groups. Secondly, the impact of multiple trials on aspirations and confidence was largely indirect because of the large performance gains accrued under this system, which in turn increased optimism. The first and second column of Table 2 indicate that this indirect effect ($T + P + X$) accounts for 66% and 77%, respectively, of the causal impact of multiple trials on variation in positive motivation. The issue of whether performance increases cause positive motivation or if these advantages are a direct result of multiple trials and absolute standards cannot be easily resolved. Performance played both a direct and mediating role in increasing aspirations, while the direct impact of multiple trials was negligible. The presence of absolute standards ($\underline{r} = -.017$) played no role whatsoever. In contrast, both multiple testing and absolute standards, albeit not in the predicted direction, impacted directly on confidence but performance gains under mastery learning still played an important role in increasing this student reaction. It appears then that the superior motivational

engagement of mastery students followed from their objectively higher performance. Moreover, this relationship held true even though their individual test performances along the way failed repeatedly to come up to their own internal standards.

System fairness and internality. The findings on the system assessment factors of fairness and internality give only modest support to the claim (e.g., Vasta, 1976) that positive evaluations in behavioral instruction are a function of high performance. To the contrary, the presence of absolute standards had a direct causal impact on these systems evaluations ($P = .370, .225$, respectively, $p < .01$), a relationship that was unaltered in the case of judgements of internality by either intervening performance level ($.004$) or number of trials ($P = .068, p < .05$). When it comes to judgements of fairness, however, multiple trials, both directly ($P = .132, p < .05$) and indirectly via performance ($.091$) enhanced feelings of equity. In addition, performance level had a substantial independent impact on estimates of system fairness ($P = .153, p < .05$), regardless of trials/standards group. This important role of performance no doubt explains why the two- and three-failure mastery groups felt more positive about the fairness of their testing system than those who failed under the conventional system. The primary point to be made here, as confirmed by incremental F-tests (Table 2), is that the major cause of both assessments of system fairness and feelings of control is the presence of absolute standards with performance increases playing no

mediating role whatsoever since the standards-performance linkage is nonexistent. Thus we find strong support for the behavioral instruction claim that the structural benefits of this system provide an improved climate for achievement even among those students who experience repeated subjective failure.

Overall, a complex dynamic is portrayed with regard to the importance of multiple trials and subsequent enhanced performance in determining the more positive motivational reactions of behavioral instruction failure students. Confidence in one's ability to do well followed almost entirely from the opportunity for multiple trials both directly and indirectly via performance gains. Similarly, the higher aspirations of the mastery-learning failure students occurred almost entirely because of the improved performance they achieved partially due to the multiple-trial option. Further, the presence of absolute standards, although unlinked to performance superiority, does facilitate positive evaluations of the instructional system. This is essential because of the importance of a sense of control and a responsive environment as motivating factors in classroom learning (de Charms, 1968). In sum, the present research strengthens the case for behavioral instruction as an effective instructional technique which provides a positive learning climate that enhances student acquisition and facilitates positive motivational and evaluative reactions. Further, this superiority exists despite the greater number of repeated failures

experienced by mastery students. Despite their repeated subjective experiences of failure, these students still performed objectively better than the two-trial conventional students. Finally, path analysis confirmed that this enhanced performance, which itself derived in large part from the multiple-test option, was the primary cause of sustained motivational involvement among mastery students even in failure.

Self-worth Theory

Much of our initial concern about mastery learning derived from self-worth formulations and the potential for student demoralization via increasing self-estimates of inability (Covington & Beery, 1976; Covington & Omelich, 1979a, 1979b, in press). It now appears that this concern was largely unfounded. This point is best illustrated by consideration of one of the defining variables for the confidence factor, that of self-estimate of ability (Table 1). First, it should be noted that all failure groups, regardless of testing system or frequency of failure, deteriorate in their self-estimates of ability from precourse to midcourse. However, the conventional FF1 group deteriorates more than those who failed the same number of times (FF2, $\underline{d} = 1.31$) or even more frequently (FFF2, $\underline{d} = .52$; FFFF2, $\underline{d} = 1.02$), $p < .05$, under the mastery system. Another path analysis, this time with change in self-estimate of ability as the dependent variable (Table 2), indicated that performance, regardless of

trials or standards group, accounts for the major portion (69%) of fluctuations in deterioration of ability estimates. Moreover, number of trials had no direct influence on changes in ability estimates ($P = -.029$). Rather the indirect effect of trials via enhanced performance (.248) accounted for almost all (99%) of the total impact of trials on changes in ability estimates. Thus, on balance, the influence of multiple trials on maintenance of self-perceptions of ability is a positive one even in failure because of the importance of repeated testing in causing performance increments. This confirms that conventional two-failure students deteriorated more in their self-estimates of ability largely because of their depressed performance level. The overall performance superiority under repeated testing more than offset the demoralizing impact of increasing self-estimates of ability.

Learned Helplessness

The long-run advantages that accrue from performance increments under mastery learning go beyond the preservation of a sense of ability even in failure and collectively ward off the symptoms of the learned helplessness syndrome, recently described as resulting from a perception of effort/outcome noncontingency (Abramson, Seligman & Teasdale, 1978). It will be recalled, we were concerned that repeated failure would lead to demoralization and subsequent lowering of one's hopes and expectancies of success. To the contrary, under the multiple trial system, our students learned that sustained

effort paid off in higher performance, even if they still considered it a subjective failure. This, in turn, generated a rather pervasive hopefulness marked by positive cognitive and aspirational consequences. More specifically, inspection of the significant change scores for conventional and mastery failure students (Table 1) indicates that while all failure students lowered their grade aspirations and more seriously entertained the possibility of failure over the evolution of the course, this deterioration was greater among conventional failure students than among any of the mastery failure groups, regardless of number of failures. Path analyses (Table 2, Figure 1) again confirmed that the major source of the greater despair in conventional students was their lower performance level. In contrast, the superior performance of mastery students allowed them to maintain important expectancies and aspirations. The central role of performance in this dynamic is dramatically demonstrated by the incremental F-tests at the bottom of Table 2: Depending on the particular variable, performance independently accounted for 63% to 87% of the explained variance in these changes occurring from the beginning of the course. Moreover, virtually any change that followed from multiple-testing opportunities was mediated by enhanced performance ($T \rightarrow P \rightarrow X$; 81-100%). It is no wonder that, even in failure, the achievement behavior of mastery students is marked by hopefulness and confidence deriving from superior performance.

We conclude that as long as students show increasing

objective performance, specific failures along the way, although demoralizing because they lead to temporary depreciation of ability estimates (Covington & Omelich, in press), play little part in determining overall positive motivational and evaluative reactions. A conventional single-trial system may provide a temporary excuse for failure in the form of ambiguous standards, competition, insufficient effort or task unfamiliarity, but multiple trials provides a more potent source of self-worth and sustained motivational involvement--higher performance. These overall performance gains more than offset the negative attributions and affect that accompany individual failures along the way. We now see that these were only temporary setbacks and give us no cause to question the superiority of behavioral instruction.

Thus, behavioral instruction appears to be a beneficial system for all students, especially slow learners who may require several tries before the material is mastered. Such is the case in the present data, where almost all students in the combined failure groups were classified as low in self-concept of ability. Some of our earlier work (Omelich & Covington, 1981) has shown that slow learners in a mastery system not only improve their own performance from trial to trial, but also perform better than their counterparts in a conventional system. They do not, however, perform up to the level of fast learners, a parity we might expect given the often-stated goal that behavioral instruction "strives to make students more alike by making them all excellent" (Born &

Zlutnick, 1972, p. 30). Even if such performance parity is unlikely, such instructional innovations allow the slow learner to maximize his/her own potential and enjoy the motivational consequences of enhanced performance. These high-risk students share much in common with the "New Student" population described by Cross (1972) as failure-prone, ability-doubting adults, for whom she describes mastery learning as the best way to overcome motivational and performance deficits. The present findings underscore the merits of her proposal.

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Table 1

Means and Difference Values on Six Evaluation Factors, Performance and Three Motivational Change Scores for Various Failure Groups

		Failure Group ^a			
		One Trial	Two Trials		
			FF1	FF2	FFF2
Performance (two tests)	$\frac{M}{d}$	23.65	36.38 12.73*	31.54 7.90*	26.25 2.60*
<u>Factors</u>					
1. Achievement Orientation	$\frac{M}{d}$	-.03	.21 -.24	.23 -.26	-.62 .58
2. System Fairness	$\frac{M}{d}$	-.50	.31 -.81*	.16 -.66*	-.15 -.35
3. Personal Confidence	$\frac{M}{d}$	-.78	.32 -1.09*	-.29 -.49*	-.25 -.53*
4. Grade Aspirations	$\frac{M}{d}$	-.60	.18 -.79*	-.40 -.20	-.54 -.06
5. System Enjoyability	$\frac{M}{d}$	-.08	-.02 -.06	-.24 .16	.34 -.42
6. Internality	$\frac{M}{d}$	-.04	-.08 .05	.19 -.22	.07 -.11
<u>Selected Change Scores</u>					
Self-estimate of Ability	$\frac{M}{d}$	<u>-1.68</u>	-.37 1.31*	-1.16 .52*	-.67 1.02*
Probability of Failure	$\frac{M}{d}$	<u>1.61</u>	.33 1.28*	.75 .87*	.67 .95*
Aspired Grade	$\frac{M}{d}$	<u>.58</u>	-.10 .47*	-.36 .22*	-.54 .04

^an's: FF1 = 74; FF2 = 76; FFF2 = 57; FFFF2 = 12.

* $p < .05$. Difference from one-trial FF group ($\underline{d}$).

Underlined values indicate significant changes from precourse to midcourse.

Table 2

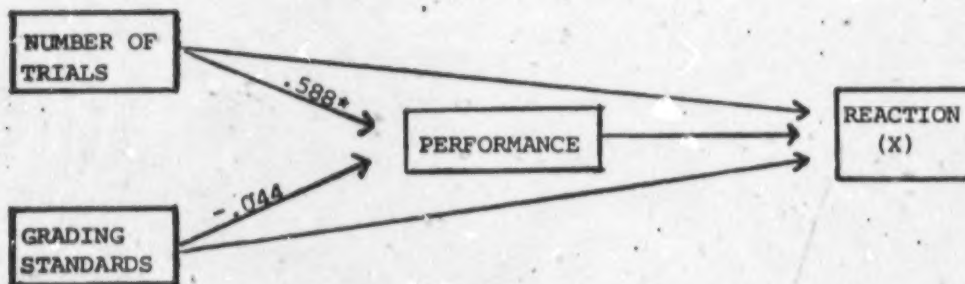
Path Analytic Decomposition of Zero-Order Correlations of Trials and Standards with
Four Evaluation Factors and Three Motivational Change Indices (X)

Causal Score ^a	Evaluation Factor				Motivational Change		
	Personal Confidence	Grade Aspirations	System Fairness	Internality	Ability Self-Estimate	Probability of Failure	Aspired Grade
<u>Trials Effect</u>							
Zero-order correlation	.325*	.134*	.228*	.022	.218*	.249*	.218*
Direct effect (T→X)	.115*	-.338*	.132*	.068	-.029	-.005	-.200*
Indirect effect (T→P→X)	.210	.472	.091	-.046	.248	-.244	.418
<u>Standards Effect</u>							
Zero-order correlation	-.235*	-.017	.363*	.229*	-.066	.056	-.039
Direct effect (S→X)	-.219*	.018	.370*	.225*	-.047	.038	-.008
Indirect effect (S→P→X)	-.016	-.035	-.007	.004	-.019	.018	-.031
<u>Independent Performance Effect (P→X)</u>	.357*	.802*	.153*	-.080	.422*	-.415*	.711*
<u>Total R²</u>	.241	.438	.199	.057	.168	.178	.379
Standards/Trials effect (direct and indirect)	66%	4%	92%	93%	31%	37%	13%
Independent performance effect	34%	96%	8%	7%	69%	63%	87%

^aTrials→Performance ($P = .588$); Standards→Performance ($P = -.044$) for all dependent variables.

Figure 1

Path diagram of postulated causal effects of grading standards, number of trials and performance on four evaluation factors and three motivational change scores.



* $p < .05$